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A. P. can cement leather to wood by using good glue.—C. F. S. will find a recipe for a red marking ink on p. 129, vol. 28.—G. W. H. will find a good recipe for mucilage on p. 251, vol. 33.—H. D. P. will find directions for gilding moldings on p. 347, vol. 31.—G. H. R. will find a recipe for hair wash on pp. 267, 363, vol. 31.—A. W. P. will find a formula for fulminating powder on p. 90, vol. 31.—W. B. and D. A. R. will find directions for proportioning cone pulleys on p. 100, vol. 25.—N. H. H. will find a recipe for filling for millstones on p. 251, vol. 31.—G. W. will find directions for removing peach stains from linen on p. 283, vol. 31.—C. A. B. will find directions for gold and silver plating on p. 405, vol. 32.—J. B. can caseharden his plow moldboards by the process described on p. 42, vol. 33.—F. D. T. will find explanations of the egg-hatching process in the *Science Record* for 1874.—W. R. B. will find directions for grinding a parabolic mirror on p. 276, vol. 30. Silvering glass is described on p. 234, vol. 30.—W. B. I. will find directions for preserving cloth goods from mildew on p. 90, vol. 31. Dyeing wool black is described on p. 75, vol. 32. Dyeing feathers on p. 299, vol. 31.—W. F. R. will find directions for mounting chromos, etc., on p. 91, vol. 32. Cleaning gilt frames is described on p. 27, vol. 31.—W. R. H. will find directions for making fruit jellies on p. 281, vol. 26.—J. C. will find directions for exterminating moths in fur on p. 388, vol. 29.—C. M. W. should read the SCIENTIFIC AMERICAN, and he will not then waste his time on the perpetual motion nonsense.—H. B. B. will find a description of the hydraulic ram on p. 269, vol. 31, and one of the construction of windmills on p. 241, vol. 32.—C. S. will find a formula for the dimensions of a fly wheel on p. 288, vol. 28.—C. E. F. will find a full explanation of the ball dropped through the earth coming to rest on pp. 138, 250, vol. 31.—C. H. S. can color paraffin with any aniline dye.—H. Y. will find that the proportions of a fly wheel are given on p. 288, vol. 28. The temperature of compressed air is discussed on p. 123, vol. 33.—H. B. can galvanize iron by the process given on p. 347, vol. 31.—A. Y. S. can waterproof canvas by the process described on p. 347, vol. 31.—E. H. P. is informed that the maximum pressure of steam depends on the maximum temperature. See p. 81, vol. 29.—G. F. G. will find a description of the carving pantagraph on p. 95, vol. 33.—C. W. M. will find directions for making plaster of Paris on p. 399, vol. 29.—C. T. S. can clean rust off an engine by the method described on p. 267, vol. 33.—J. L. B. should not run the risk of spoiling her hair by using nostrums, which are always deleterious.—A. A. D. can make battery carbons by the process described on p. 35, vol. 33.—W. R. should apply to Seth Green, Esq., Rochester, N. Y., for the best method of stocking a stream with trout.—E. H. will find a description of lap and lead on p. 101, vol. 32. Crucibles are described on p. 309, vol. 31.—J. F. W. will find a recipe for axle grease on p. 90, vol. 31.

(1) J. A. M. asks: How can I clean stone ware jars that have had muriatic tin crystals in them, so that they can be used for fruit, etc.? A. The tin may be removed by muriatic acid.

(2) J. M. H. says: The phenomena referred to on p. 193, vol. 33, can be easily and satisfactorily explained by supposing that the boiler in the first case was quite hot and not of very large size, but of thick iron; and the water being introduced—not very rapidly—the small quantity became heated intensely, producing the 190 lbs. pressure indicated. In the other case, it is probable that the boiler was not so much heated as supposed, or the boiler iron not so heavy, or both, or the water may have been introduced much faster than in the first instance. If the boiler was not very hot and the water was introduced quite rapidly, it would have had precisely the effect stated. The first water introduced would be converted instantly into steam, which was suddenly condensed by the rapid cooling of the boiler and its contents by the working of the pump. These are the several conditions which, I think, would, separately or together, have produced the results stated. A. Our correspondent is entitled to especial commendation for the clear and satisfactory explanation here given. Of course the causes of such occurrences must be matters of theory to a great extent, but J. M. H.'s views are very reasonable.

(3) J. P. M. says: Having had a conversation with the late chief engineer of the United States Navy, he says tallow or grease of any kind should never be used in the cylinder of any engine, only a little pure beeswax on the piston rods. Ought we to stop using tallow, as we now do? A. If you are sure that the tallow is pure, you may continue to use it without fear. But in general, we think it is preferable to use good oil.

(4) A. B. C. asks: There are two boilers in Rensselaer county, N. Y., which are running without safety valves or steam gages. Is there any law to prevent this? They are old boilers, but have recently been repaired. A. We do not think there is any law, and we can scarcely believe that any one would be foolhardy enough to carry much pressure under such circumstances. We wish you would send us further particulars. If the owner of the boilers is running them in entire ignorance and carelessness of the pressure, you will be doing good service by sending us his name for publication. We may add that, in the absence of a special preventive law, the owner of these boilers can be prosecuted on the complaint of any one who thinks that he is conducting his business in a manner that is dangerous to the community.

(5) J. A. D. asks: How can I polish wrought iron? A. Warm your goods till they are unbearable to the hand; then rub with new clean white wax. Heat the goods again so that the wax may soak in them; then rub them over with a piece of serge.

(6) G. R. asks: Is there a practical way of determining when an engine is precisely on the center, independent of the guides? A. Strike on the end of the crank a circle of the same size as the crank pin; then (for a horizontal engine) place the crank pin as near the center as the eye will direct, then place a straight edge with one end resting on the crank pin and the other even with the corresponding diameter of the circle. Upon the straight edge rest a spirit level, moving the crank till the level stands true. If, however, the cylinder is not set quite level, first place the spirit level on the piston rod, note how the bubble stands, and then move the crank pin till the bubble of the spirit level, applied as directed, stands as upon the rod.

(7) F. H. D. asks: 1. Is there any difference in the tractile power of a locomotive drive wheel when the crank goes over or under the axle in ascending a grade? A. No. 2. Is the leverage on the axle the only leverage there is in ascending a grade? A. Yes, as we understand your question.

(8) C. A. asks: Why does a ball, fired from a barrel 6 inches long, fail to go straight to its mark at 10 yards distance? A. The barrel is too short to throw a ball with any degree of accuracy to the distance you mention. The resistance of the air to the ball at such a distance also causes deviation

(9) J. W. K. says: I have been told that some planters in Louisiana employ electricity in the process of purifying cane juice. The juice itself is said to form part of the battery. Is this so? A. We have never heard of such use of electricity, and do not think the statement can be correct.

(10) C. S. R. asks: 1. How can I put a point of metal or iron on a worn-out metal plow point, in a common smith's fire? A. The remains of the old steel or the plow will show the shape of the weld. Use shear or cast steel, using borax as a welding compound; be careful not to overheat the steel. 2. How can I temper cold chisels, and drills for drilling iron and other metals, and stone? A. You will find directions for tempering drills and cold chisels for metal, etc., in "Practical Mechanism," No. 4, p. 21, vol. 31. To temper cold chisels for stone, heat the chisel in a charcoal fire, and temper to a brown color.

(11) E. A. K. asks: What can be added to a tempering solution that will give the steel a bright silver color without impairing the tempering qualities of the solution? A. Nothing.

(12) F. B. M. asks: How can I test gold with acid, and what kind of acid is used for that purpose? A. The touchstone used for this purpose is a piece of black basalt, or even black slate, over which the gold to be tested is drawn so as to leave a streak of the fine particles upon the surface. This streak, of course, remains untouched when moistened with nitric acid; but if a streak of any base alloy (of copper and zinc, for example), made to imitate gold, be made upon the touchstone, the nitric acid will immediately dissolve it. The acid employed in this test is generally mixed with a minute proportion of muriatic acid (98 parts by weight of nitric acid, of specific gravity 1·34, 3 parts hydrochloric acid of specific gravity 1·173, and 25 parts water. The streak is not apparently affected by the acid if the gold is not below 18 carats fine; by making several streaks in succession, or by grinding off a portion of the surface upon the touchstone, any error arising from the thin external coating of fine gold may be avoided; a feather or glass rod serves for moistening the streaks with the acid. In order to determine by the touchstone the proportion of gold which is present in the alloy, the streak is compared with that made by a series of touch needles, composed of alloys containing gradually diminishing quantities of gold. In experienced hands the quantity of gold may thus be ascertained, with an error of not more than one part in a hundred.

(13) G. B. asks: 1. Will a copper ball, made hollow and perfectly tight, float on the water inside a steam boiler with the steam at any desired pressure? A. Yes. 2. Will the heat of the steam injure a brass or steel spring? A. Yes. The injury to a well made spring will be very slight, however.

(14) B. T. P. asks: Please give me directions for tinning wrought iron wire. A. Clean the wire, cover it with a solution of muriate of zinc, and dip into melted tin.

I wish to send some dead birds 1,500 miles. How can I prepare them so as to prevent decomposition? A. It will be best to pack them in ice and sawdust or tan bark.

(15) N. A. W. asks: What are hyperbolic logarithms? A. The hyperbolic logarithm of a number is the power to which it is necessary to raise the quantity 2·7182818, in order to produce the given number.

(16) J. J. M. says: A Hunter's screw has a lever 51 feet long. The distance between the threads of larger screw is 1 inch, and between those of the smaller, ¾ inch. How much weight can a man whose power is represented by 175 lbs. move with such a screw? A. Disregarding friction, the relation of the force to the weight is about as 1 to 1,200, that being the proportion between the distances passed over by each in the same time.

(17) J. A. McC. asks: Is there any kind of steel that may properly be called a natural production? A. Steel is an artificial production, in the sense in which that term is ordinarily employed. There is no native steel.

(18) F. B. asks: Upon a railroad car in rapid motion, I let fall a ball striking the floor. A friend says that the ball will strike at precisely the same point that it would if the car were standing still. I say the projective force given to me and the ball by the engine ceases to act upon the ball after it leaves my hands until it strikes the floor, hence the floor is a curved line. A. Your idea is correct, but the time of descent is so slight that the curve is practically a straight line.

(19) J. B. F. says: I have a pair of cylinders, 2½ inches bore×4 inches stroke, and a boiler with 169 tubes of half inch internal diameter; outside shell is 18 inches in diameter by 28 inches high. I want to run a boat 30 feet long by 5½ feet beam. 1. What will be the size of a propeller suitable for this engine and boat, pressure of steam being 150 lbs.? A. Use a propeller of from 28 to 30 inches diameter and of 3 to 3½ feet pitch. 2. What speed could be obtained with the above? A. Probably from 6 to 7 miles an hour.

(20) C. J. A. says: 1. I have a muzzle-loading rifle that carries a ½ oz. round ball, and a 1 oz. conical ball; and with the same elevation of sight, same kind of patch, same charge of powder, and sighted at same object, it will throw the conical ball nearly twice as far as the round one. Why is this? A. The conical ball, on account of its shape, encounters less resistance from the air than the other. 2. In shooting over water for a thousand yards or more, does it cause the ball to fall more than it would over the same distance of land? A. No.

(21) W. H. L. asks: What is the most simple way to make a battery for plating? A. See answer to F. C., on this page.

(22) J. T. H. asks: Who is Darwin, and what is his doctrine? A. He is an English naturalist, and his theory is that all animal forms have a common origin. This is commonly known as the theory of evolution.

A friend says that if a thimbleful of gunpowder be confined in a solid block of steel of 4 feet cube, and ignited, it would burst the steel. I say it would not. Which is right? A. You are.

Suppose I have two tubes with 4 inches of water in one and 10 inches in the other, and I put 1 inch of water more into each tube, will this last inch create any more pressure at the bottom of one tube than the other, the tubes being the same size? A. Yes, as we understand your question.

Will a 3 horse engine do the same amount of work that 2 good horses do? A. An engine exerting an effective horse power can do more work than an ordinary horse in a given time.

(23) F. O. says: The floor of my verandah is made of tongued and grooved boards, and painted over. The boards have shrunk, and water leaks through in rainy weather. I have filled the space between the boards with putty, but would it not be best to cover the whole floor with canvas or duck, tacked on and covered with paint? A. Try asbestos cement, which is procurable from the manufacturers of heavy iron skylights.

(24) J. C. asks: What is the proper way of setting picket fence posts? The posts are 3½ feet above ground, tapering from 5x5 inches to 5 x 3 inches. A. It depends upon what kind of picket fence you wish to build. If the rails are to be sunk into the sides of the posts, in the usual way, and the pickets extend above the top of the posts, set the latter so that they will appear of uniform width from top to bottom when viewing them from the front or back; set the front side of the post perpendicular, and let the incline be entirely on the back.

(25) W. A. asks: Has anything been invented of the nature of a looking glass for discovering anything at the bottom of deep water? A. Marine telescopes for this purpose have long been in use. Some of them are provided with lamps.

(26) N. K. B. asks: Can you give a formula for finding the area of an inscribed regular polygon, when the perimeter of polygon and area of circumscribed circle are known? Can you give formulas for finding the number of its sides? Are the data sufficient when only one polygon will answer the conditions? A. We do not think that direct formulas could be given, but the solution might be made by the aid of properly constructed tables.

(27) A. B. S. asks: 1. Where was the first railroad built in the United States? A. From Milton to Quincy, Mass., in 1826. 2. Where was the first in the South? A. The Baltimore and Ohio railroad was commenced in 1828, and 15 miles were opened to travel in 1830.

(28) A. L. M. asks: What is meant by the number of inches of water used in driving a turbine wheel? A. It refers to the size of the aperture, as generally employed.

In a recent issue you say one requisite for an artesian well is that it should be surrounded by mountains or high land. If so, how does it work in a level desert? A. The high land in such a case is at a great distance.

Can you explain how logarithms are calculated? A. You will find the formula, in as simple terms as it can well be expressed, on p. 283, vol. 32. The whole subject is well treated in Law's "Logarithms," Weale's series.

Would hickory sawdust do to make paper pulp of? A. You should address a wood paper manufacturer.

How is the angle for bevel gearing found? I have a plan for finding it which, if not identical with yours, I will communicate. A. We should be glad to see your method. It is quite a simple problem.

(29) C. B. B. asks: What method is used to obtain the brilliant polish usually observed on steel watch chains, buttons, etc.? A. Use first emery (on belts), then crocus, and lastly rouge or polishing powder.

(30) M. says: I want a 50 horse power boiler, but can get from none of the makers satisfactory information as to what constitutes a horse power. Makers of tubular boilers rate their boilers by the number of square feet of heating surface that they allow to a proportionate amount of grate surface, and they range all the way from 10 to 22½ square feet. We are thus led to infer that a horse power is merely a nominal thing. But there must be something definite that constitutes in all cases a horse power in a boiler. The makers of some sectional boilers claim that the evaporation of 30 lbs. water into good dry steam per hour constitutes a horse power, therefore the evaporation of 1,500 lbs. of water per hour will give me a 50 horse power boiler. This seems like something tangible, but is it correct? Must a boiler evaporate that amount per hour in order to fill the requirements, and should a boiler that falls short of doing this be rated less? A. There is no standard for the horse power of a boiler. The proper way to rate the capacity of the boiler is by the number of lbs. of saturated steam that it will furnish in a given time, as, for instance, an hour.

(31) J. W. F. asks: Please give me directions for crystalizing pears, cherries, etc, to produce articles equal to the French fruits. A. Wash carefully, and then dry, dip in thin gum arabic, and sprinkle with finely granulated sugar.

(32) J. N. P. says: "The Catechism of the Locomotive" gives the following rule for calculating the average or mean pressure when steam is used expansively in the cylinder: Divide the length of the piston's stroke in inches by the number of inches at which steam is cut off; the quotient is the ratio of expansion; find the hyperbolic logarithm of the ratio of expansion, add 1 to it, and divide the sum by the ratio of expansion, and multiply the quotient by the mean absolute steam pressure in the cylinder during its admission. The result will be the mean absolute pressure during the stroke." Why do I have to add 1 to the logarithm? A. It is the result of a mathematical investigation too long to be given here, but which you will find explained in works which treat of the theory of the steam engine. 2. How do I find the hyperbolic logarithm of a number? A. To find the hyperbolic logarithm of a number, multiply the common logarithm by 2·302585.

(33) G. B. asks: What can I use to form a hard transparent varnish for paper, that will stand handling and cleaning with water? A. We think that good dammar gum in turpentine will give satisfactory results.

(34) F. C. asks: I. How can I construct and use the simplest battery that can be made for gold and silver plating? A. Put a little sulphate of zinc in a jar of water; place a piece of sheet copper, to which a wire is soldered, at the bottom of the jar, and suspend a piece of zinc at the top. Connect the zinc with the object to be plated. The wire from the copper, which should pass through a glass tube in the jar, is then connected to the other electrode in the plating solution. A few lumps of blue vitriol must be dropped in the battery after it is set up, and more added from time to time, but care must be taken that the blue line does not quite reach the zinc. From one to three cells will be required. 2. Would an unglazed flower pot do for a diaphragm? A. It is probably baked too hard.

(35) E. G. F. says: A friend asserts that a locomotive will pull more than it will push. I contend that its power is equal in both directions. Which is right? A. You are.

(36) A. S. G. asks: 1. What is the chemical reaction in the Grenet battery? The fluid is sulphuric acid, water, and potassa bichromate. No gas is perceptible, but a little vapor condenses on upper part of cell. A.

$$K_2Cr_2O_7 + 4H_2SO_4 = 2KCr_2SO_4 + 4H_2O + 3O$$
$$3Zn + 3H_2SO_4 = 3ZnSO_4 + 3H_2O + 3H_2$$

2. In using a small induction coil I find that, on bringing my finger near one pole of outer coil, sparks pass, seemingly from the finger to the coil. I can feel nothing from the other pole unless the circuit is made through me. Changing the direction of primary current seems to make no difference; the same pole receives sparks, and the other is indifferent. How is this? A. Appearances seem to indicate that one end of the coil is not properly insulated from the base. 3. What is the object of the pole changer on induction coil? A. Convenience in reversing the direction of the current, which is often desirable in experimenting with Geissler tubes and for cutting the battery out of circuit.

(37) S. H. L. asks: Is there any process by which ivory, exposed to the atmosphere, may be made to retain its original whiteness? A. Cover it with some transparent protecting varnish.

(38) P. K. W. asks: 1. If a filter be built of brick in a cistern closed at the top, and covered with water, will not pumping out of the filter draw more water into the filter? A friend claims the pumping does not help to draw the water in the filter, that it only runs in of its own accord. A. Your friend is right. 2. I claim that air can be forced in the filter until it will exceed the pressure of the water outside the filter, and keep the water out. Is this so? A. Unless the top of the cistern be airtight, you cannot force air into the filter to a greater pressure than that of the atmosphere without; and if it is airtight, and the spring is near the bottom of the filter, the water will still enter the filter as high as the top of the spring, or until it traps it. If the spring is in the top of the filter, the water will entirely displace the air, and fill the filter, no matter what is the pressure.

(39) J. S. S. asks: How much power is required to run a 3½ feet burr, to grind 6 bushels of meal per hour? A. From 4 to 5 horse. It would be more economical, however, to use a smaller mill for this limited amount of work.

(40) C. B. B. says: I have a toy steam engine, and the engine, which screws on to the boiler, is rusted in so that I cannot unscrew it. How can it be unscrewed? A. Heat the connection in a gas flame.

(41) W. W. says: I read, on p. 187, vol. 33, in reply to G. D.: "It is likely that the law of your State, forbidding the sale of goods manufactured under your patent without a seller's license, may be enforced," etc. As letters patent under the law of Congress are to grant unto the patentee, his heirs or assigns, for the term of 17 years, the exclusive right to make, use, and vend his invention throughout the United States and the Territories thereof, will not State legislation, which imposes conditions and burdens on the rights thus guaranteed, in effect abrogate a law of the general government? A. Any State law which imposes special taxes upon patented goods, or aims to interfere with the free exercise of a patentee's privileges in the sale, manufacture, or use of his patent or invention, is invalid. This has been so decided by the United States Courts. On the other hand it has also been held that States have a right to impose equal taxes for the support of their local governments: have a right, for example, to tax their own citizens and all other persons who vend goods within the State. All venders are treated alike, and the vender of patented goods is not excused from such taxation.

(42) E. M. R. recently asked: "Why does water shorten a rope?" One of our learned professors charged with the answering of this query gave the following reply: "We were under the impression that wetting a rope exposed to strain caused it to stretch." The absurdity of this answer has been noticed by several of our correspondents. Everybody knows that the wetting of a rope exposed to strain or when not exposed to strain causes it to shorten. This is doubtless due to capillary attraction, by which the water is drawn in between the fibers with such force as to push them apart, thus causing a longitudinal contraction of the rope. The energy of the contractile force developed by wetting strained ropes is often usefully applied, and there have been many remarkable examples. C. L. T. tells that he was riding on a train when the locomotive got off the track; it required lateral movement of two inches for replacement. No appliances were at hand except a large dry rope. This was attached to the locomotive and to the trunk of a neighboring tree, then strained as tightly as possible. All hands were set to work to wet the rope, which quickly began to contract, and soon the locomotive was on the rails again. J. A. T. says: In the army a man is always supposed to be left in charge of a certain number of tents, to loosen the stay ropes in case of rain; and I recollect, upon one occasion when this precaution was neglected, a heavy rain coming on, all the posts to which these guys were attached were drawn out of the ground by the shortening of the ropes, and the tents were soon flying before the wind. B. says: All housekeepers have an experimental knowledge of the contractile power of wetted clothes lines in drawing the rope posts out of perpendicular.

(43) L. K. L. says, in reply to a query as to the maximum speed ever attained by steamboats: The Daniel Drew, the Mary Powell, and the Chauncey Vibbard, Hudson river steamers, are the three fastest steamboats in the world, remarkable time having been made by all. I have been informed that the Daniel Drew has made 25 miles per hour. The Mary Powell has beaten this, having made 27 miles an hour. But best of all, and I get it from good authority, the Chauncey Vibbard has run from West Point to Newburgh, 10 miles in 20½ minutes, or at the rate of a little less than 30 miles an hour.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Coast of Texas. By F. W. R.

On Steam Boiler Phenomenon. By W. B, and by P. K.

On Gravity on the Earth and the Moon. By F.C.

Also inquiries and answers from the following:

J. C.—R. K. T.—J. C.—J. S.—J. B. H.—E. B.—C. A. A.—J. S. B.—W. H. R.—L. F.—C. W. J.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who sells aneroid barometers? Whose is the best steam pressure gage? Who makes telescope objectives? Why do not makers of ships' compasses advertise in the SCIENTIFIC AMERICAN?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

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8,665.—HANDLES.—C. F. Haviland, Paris, France.
8,666.—BOTTLES.—G. C. Ovens, Red Bank, N. J.
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8,669.—SIGN.—F. McLewee, New York city.
8,670, 8,671.—BOTTLES.—W. R. Warner, Philadelphia, Pa
8,672.—INKSTAND BASE.—B. Brower, New York city.